V. Community Risk Assessment and Analysis Process

The CWPP handbook calls for a community risk assessment to evaluate several items. These are:

- Fuel hazards.
- Risk of wildfire occurrence.
- Homes, businesses, and essential infrastructure at risk.
- Other community values at risk
- Local preparedness and firefighting capabilities.

The use of maps to display specific characteristics is essential in the analysis and risk assessment process. Maps provide a visual depiction of the analysis and planning area and display specific information needed by the core team for decision-making. Mapping is the most effective tool for evaluating the five community risk factors.

Greater Williams area CWPP meeting. Source: G. Kleindienst

The Williams Ranger District was instrumental in providing their Geographic Information Systems (GIS) mapping services and personnel. The risk factor evaluation and assessment process, and the associated map development process are described below.

A. Fuel Hazards

The dominant overstory vegetation map (Map 3) is used to depict the vegetation on the Williams Ranger district and shows the range of different types of vegetation found. Vegetation ranges from low elevation pinyon juniper grasslands near Ash Fork to the mixed conifer vegetation found on Sitgreaves, Kendrick, and Bill Williams Mountain. The map also shows the ponderosa pine zone that is the western edge of the world's largest contiguous stand of ponderosa pine that

ranges from west of Williams to the east through the White Mountains and ends in New Mexico on the Gila National Forest.

The crown fire risk assessment map (Map 4) shows areas of potential risk ranging from low to extreme. The map clearly depicts the higher risk ratings associated with the timbered areas of the District. This map was developed using the Forest Service INFORMS computer program.

INFORMS is a decision support framework designed specifically for the Forest Service. The acronym comes from "Integrated Forest Resource Management System." INFORMS was engineered to support planning efforts associated with both watershed and project level planning and is ideal for the CWPP planning process. INFORMS utilizes several existing Forest Service software programs including Forest Vegetation Simulator (FVS), Most Similar Neighbor (MSN) analysis, and the Fuels and Fire Extension (FFE) to the FVS program. INFORMS uses actual forest stand examination data within the FVS program and can populate uninventoried areas with data through the MSN program. Confidence levels are evaluated on all areas with unknown stand exam data and the Forest field checks those areas that lack a high confidence rating.

Using the Forest Service INFORMS program to evaluate the fuel hazard risks provides a widely accepted and tested method to determine relative risk. INFORMS can also test the effectiveness of various fuels treatments over time. It can be used on a large scale and is defined in this CWPP analysis as a coarse filter or landscape level analysis.

The Fire and Fuels Extension of FVS provides a burn model that determines a torching index and a crowning index. The torching index depends on surface fuels, surface fuel moisture, canopy base height, slope steepness, and wind reduction by canopy. The torching index simply expresses the likelihood of a surface fire reaching intensities where the fire burns the crowns of individual or small clumps of trees. The crowning index depends on canopy bulk density, slope steepness, and surface fuel moisture. As a stand becomes denser, active crowning occurs at lower wind speeds, and the stand is more vulnerable to crown fire. The crowning index is simply the likelihood that once a wildfire begins torching, whether the fire will continue to spread through the adjacent crowns.

Torching trees. Source: G. Kleindienst

These indices link directly to terminology used in defining wildfire spread. "Surface" fires burn only those fuels on the ground with little effect on tree crowns. "Passive crown fires" have sporadic torching or short-lived crown fire runs, but continues to drop back to the ground as a surface fire. "Active crown fires" consume the majority of the fuels, both surface and crown, and are highly destructive.

An alternative risk assessment process that was used in the Forest Ecosystem Restoration Analysis project (Forest ERA) that was conducted by Northern Arizona University was considered as an alternative to INFORMS. The CWPP core team felt that the planning area was small enough encompassing only one federal jurisdiction, and that using the Forest INFORMS program offered a better analysis and risk assessment. Even though INFORMS in this CWPP analysis is considered "coarse filter", it does rely on specific stand exam data in the FVS program and therefore provides a more comprehensive analysis and risk assessment process.

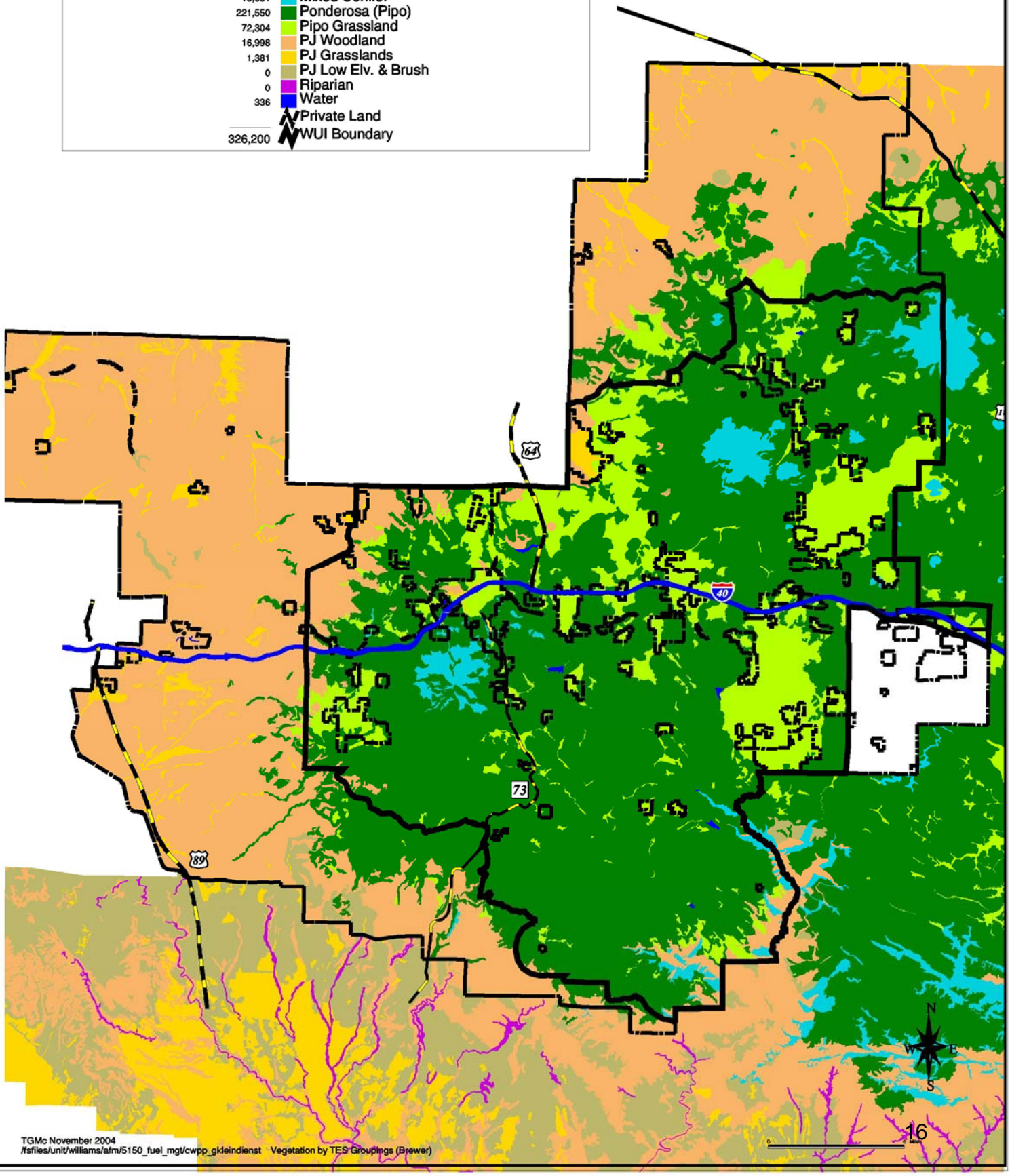
The Forest ERA Project used a more involved process with more stakeholders and a wider range of values on more of a macro scale than the CWPP process. It is interesting to note, however, that the Forest ERA Project had a similar outcome in the area of priority setting. (See Figure 23, page 26, Volume 2 - Western Mogollon Plateau Adaptive Landscape Assessment Report, Forest Ecosystem Restoration Analysis – Project Report, 2002-2004). For a copy of this report contact Northern Arizona University's Forest ERA department.

DOMINANT OVERSTORY VEGETATION & WUI BOUNDARY

Kaibab National Forest
Williams Ranger District
Coconino County

Map 3

WUI ACRES	
13,631	Mixed Conifer
221,550	Ponderosa (Pipo)
72,304	Pipo Grassland
16,998	PJ Woodland
1,381	PJ Grasslands
0	PJ Low Elv. & Brush
0	Riparian
336	Water
	Private Land
326,200	WUI Boundary



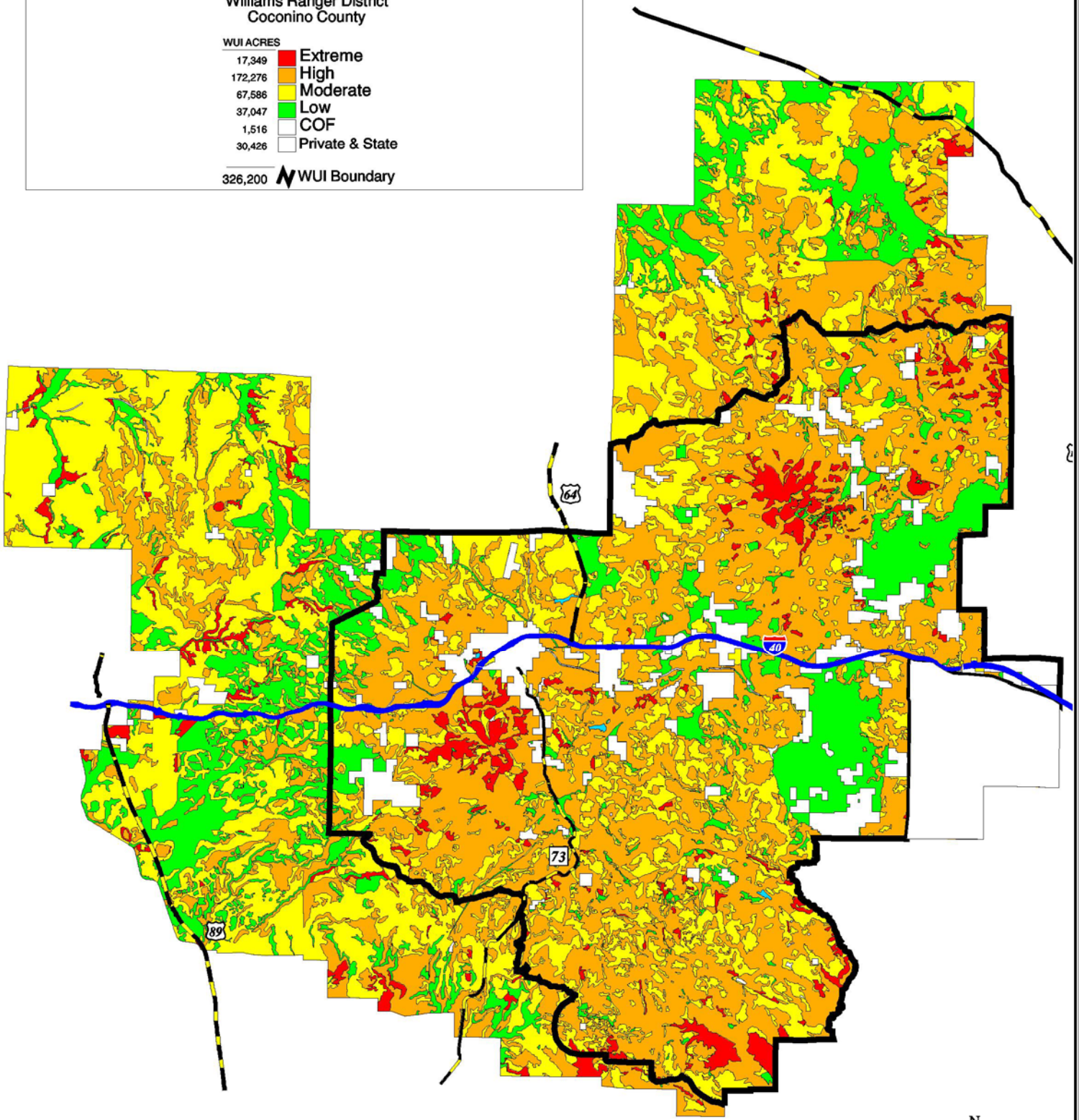
TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst Vegetation by TES Groupings (Brewer)

CROWN FIRE RISK ASSESSMENT & WUI BOUNDARY

Kaibab National Forest
Williams Ranger District
Coconino County

Map 4

WUI ACRES	
17,349	Extreme
172,276	High
67,586	Moderate
37,047	Low
1,516	COF
30,426	Private & State
326,200	WUI Boundary



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TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst Crown Fire Risk

B. Risk of Wildfire Occurrence

The 20 year fire occurrence map (Map 5) and the large fire occurrence map (Map 6) clearly show that the majority of the wildfire starts and the large fire occurrence have historically happened in the timbered areas of the Williams Ranger District. The 20 year average for the District is 95 fires burning 902 acres annually.

Mathes fire, Grand Canyon National Park, 1995. Source: G. Kleindienst

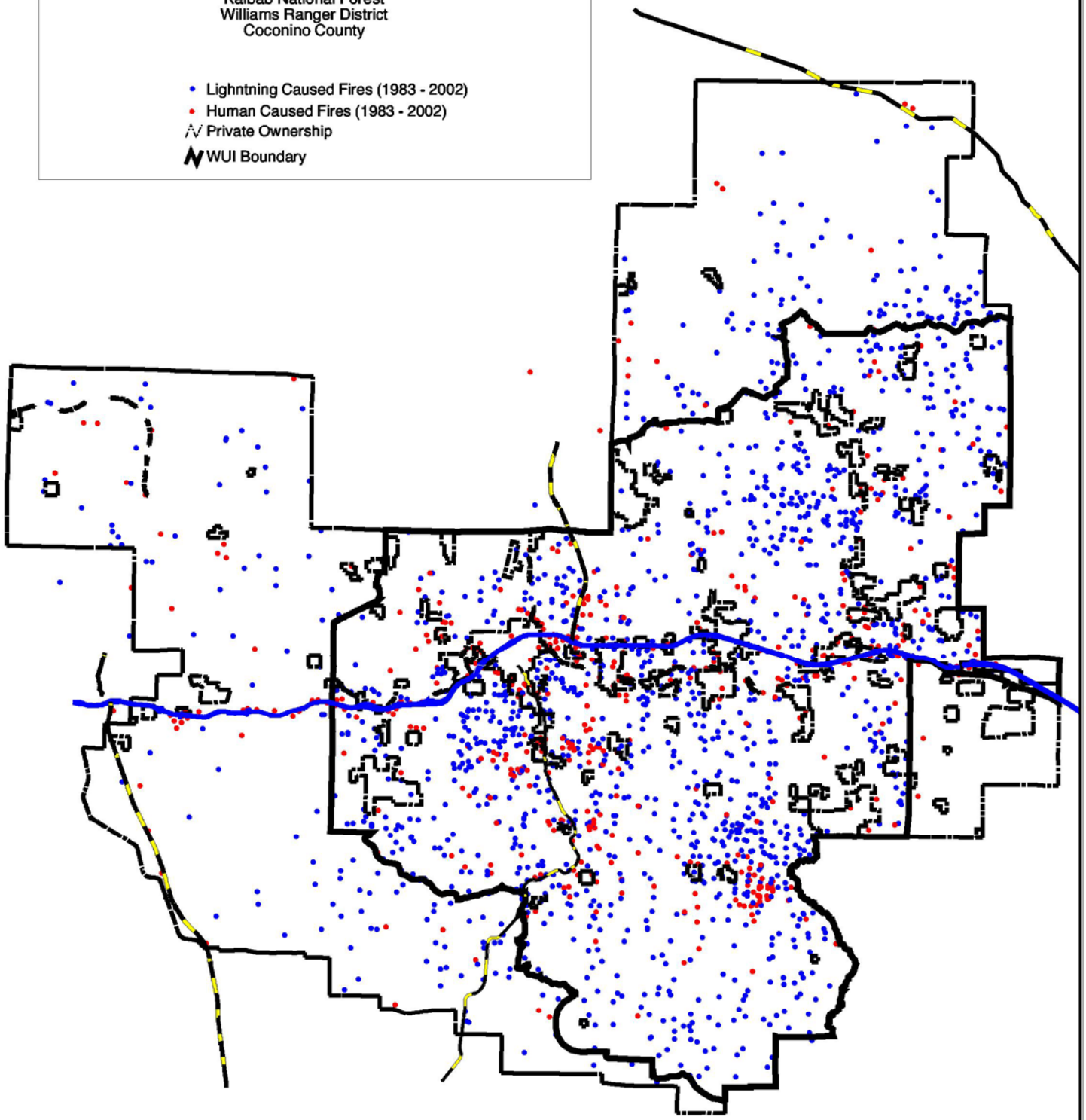
Burned home, Florida fires, 1998. Source: G. Kleindienst

20 YEAR FIRE OCCURENCE & WUI BOUNDARY

Map 5

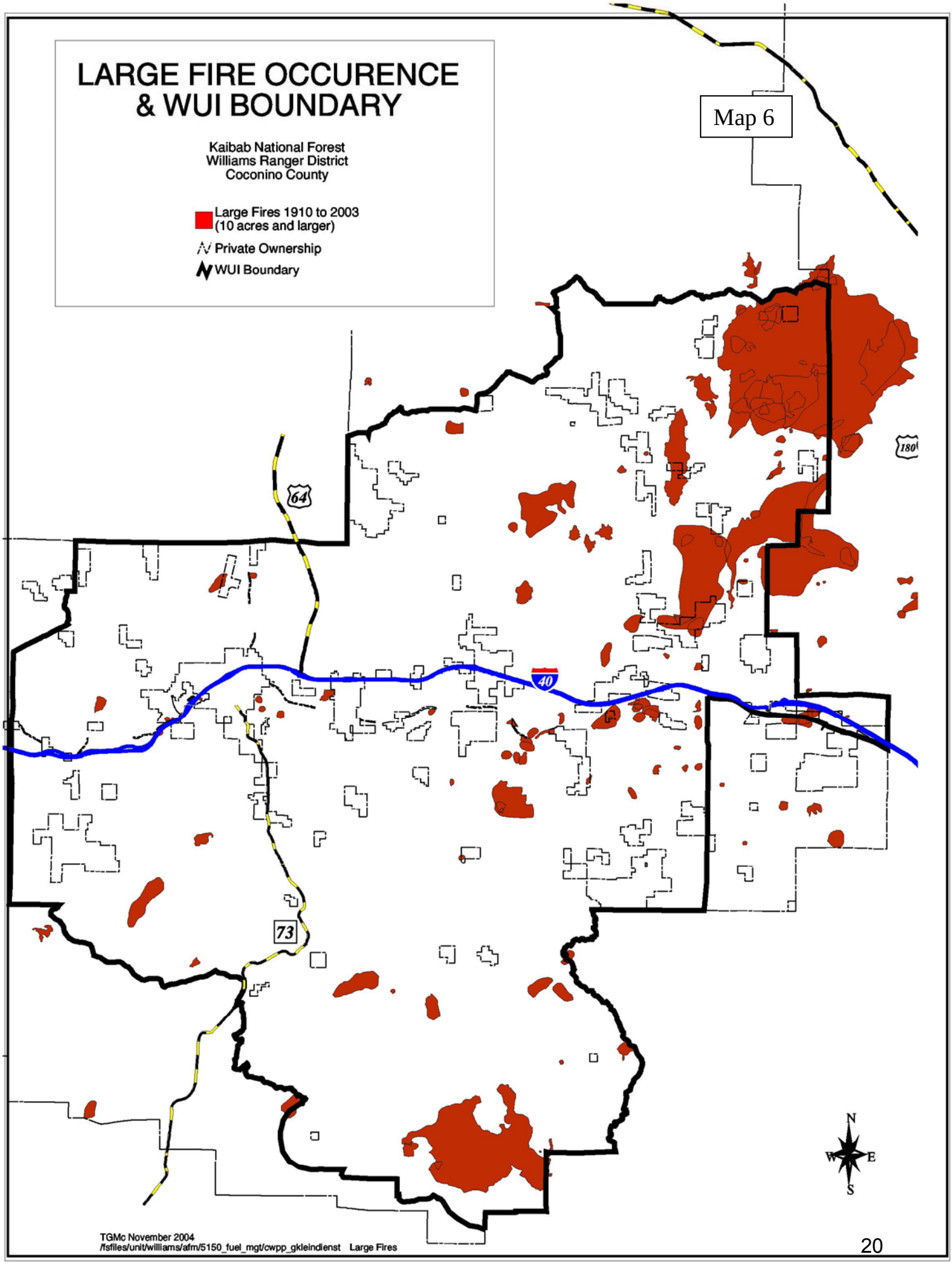
Kaibab National Forest
Williams Ranger District
Coconino County

- Lighntning Caused Fires (1983 - 2002)
- Human Caused Fires (1983 - 2002)
- Private Ownership
- WUI Boundary



N
W E
S

TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst All Fires 1983-2002


LARGE FIRE OCCURENCE
& WUI BOUNDARY
Kaibab National Forest
Williams Ranger District
Coconino County
Large Fires 1910 to 2003
(10 acres and larger)
Private Ownership
WUI Boundary
Map 6
64
40
180
73
N
W
E
S
TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst Large Fires

C. Homes, Businesses, and Essential Infrastructure at Risk

The development risk assessment map (Map 7) was developed by visiting nearly all of the private lands in or adjacent to the ponderosa pine and Douglas fir timbered portions of the District. The development risk map was developed to show which parcels of private land had some form of development and are shown on the map in red. Undeveloped private land is shown in yellow. Development of these private lands ranges from a single cabin to the incorporated City of Williams. Many of these private parcels have multiple homes and subdivisions with several parcels containing homes worth several hundred thousands of dollars.

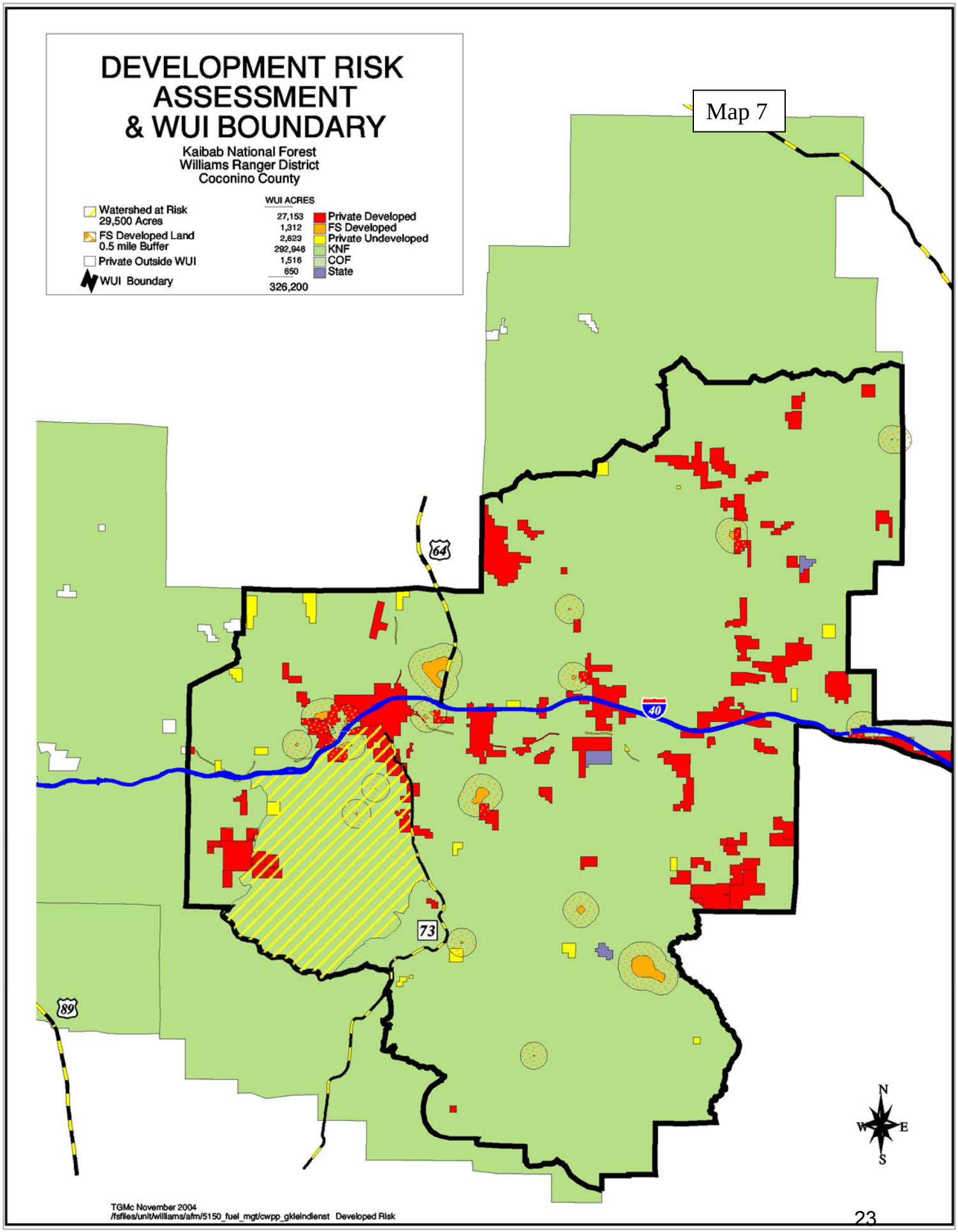
The Forest Service also has many developed lands within the timbered zone including; developed campgrounds, ski lodge, electronics sites, lookout towers, and administrative sites. These areas are shown on map 7 in orange with a ½ mile buffer around the sites to better identify them on the map.

D. Other Community Values at Risk

Bill Williams Mountain was identified by both the City of Williams and the USDA Forest Service as a critical resource deserving special protection from catastrophic wildfire. Bill Williams Mountain lies just south of Williams and has an elevation of 9,256 feet. There is a multi-million dollar electronics site on the top of the mountain providing communications towers for the Department of Public Safety, USDA Forest Service, Arizona State Land Department, Burlington Northern Santa Fe railroad and several other governmental and private enterprises. The north side of the mountain is home to a small ski resort, and homes and other infrastructure surround three sides of the base of the mountain. Most importantly, Bill Williams Mountain is the apex of three critical watersheds; the Sycamore and Hell Canyon watersheds to the south and east, the Cataract Creek and Spring Valley Wash watersheds to the north, and the Ash Fork Draw and Upper Partridge Creek watersheds to the west. The City of Williams still relies heavily on surface run-off and several reservoirs for their domestic drinking water. A stand replacing wildfire on Bill Williams Mountain could result in a loss of critical emergency communications systems, silting in of reservoirs, loss of water storage, loss of recreational areas and opportunities, and the potential loss of lives, homes, and critical infrastructure.

Bill Williams Mountain. Source: G. Kleindienst

The Healthy Forest Restoration Act requires that other values needing special protection be evaluated using fire regime and condition class. The USDA Forest Service has determined that the timbered area of the Williams Ranger District is a historical fire regime I. Fire regime I is defined as an area in which historically there have been low severity fires with a frequency of 0 through 35 years that is located primarily in lower elevations of pine, oak, and pinyon juniper forests. The forest has also determined that Bill Williams Mountain is in either a condition class 2 or 3. Condition class 2 and 3 are defined as a vegetation composition, structure, and fuels that have a moderate or high departure from the natural fire regime and predispose the system to risk of loss of key ecosystem components. Wildfires are moderately or highly uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are substantially outside the natural range of variability. The forests fire regime and condition class determination for Bill Williams Mountain allows for special protection measures and meets the requirements as set forth in HFRA. Map 7 depicts the Bill Williams Mountain protection area in crosshatched yellow.


DEVELOPMENT RISK ASSESSMENT & WUI BOUNDARY
Kaibab National Forest
Williams Ranger District
Coconino County
Watershed at Risk 29,500 Acres
FS Developed Land 0.5 mile Buffer
Private Outside WUI
WUI Boundary
WUI ACRES
27,153 Private Developed
1,312 FS Developed
2,623 Private Undeveloped
292,946 KNF
1,516 COF
650 State
326,200
Map 7
64
40
73
89
N
W
E
S
TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst Developed Risk

E. Local Preparedness and Firefighting Capability

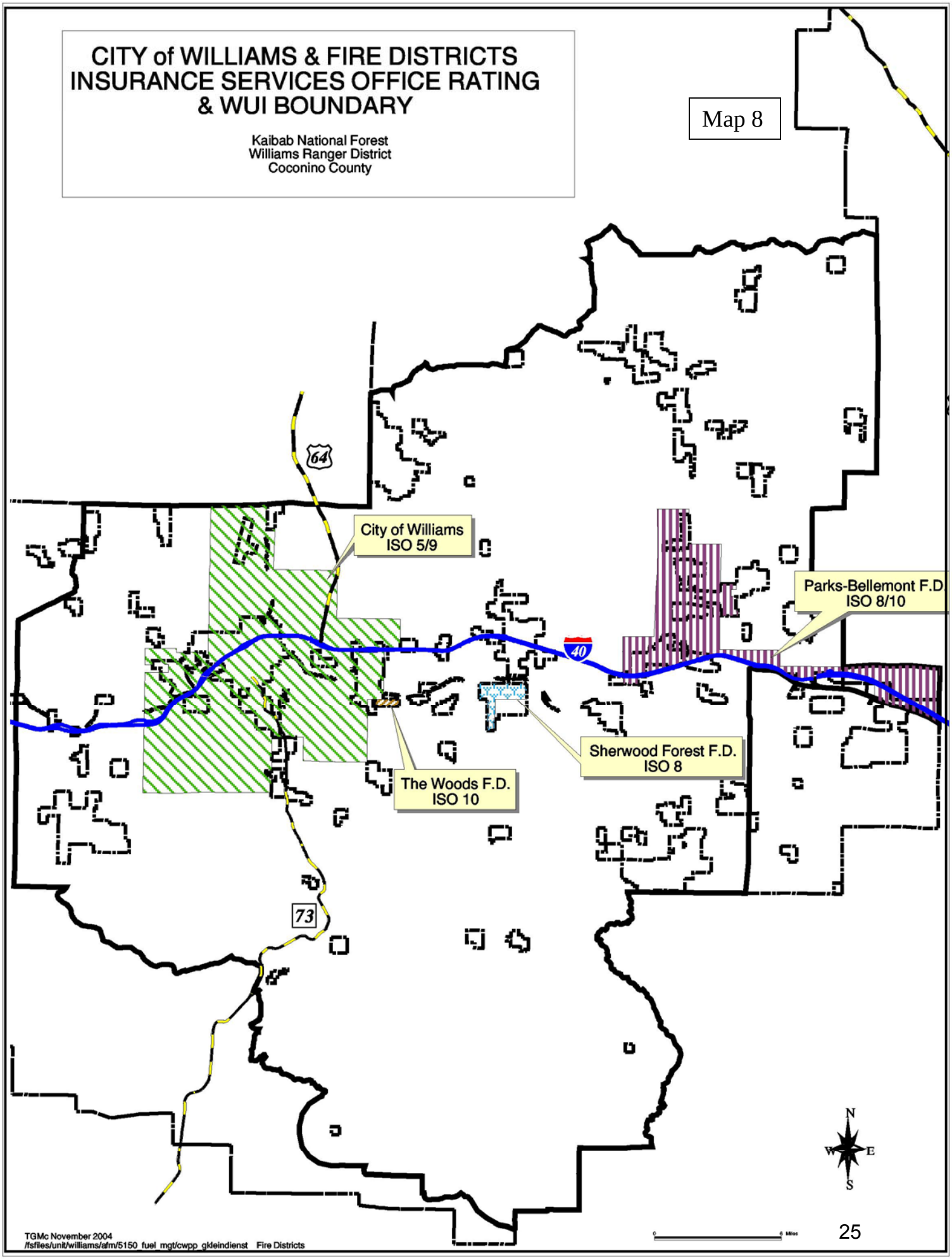
The Wildland Fire Advisory Council (WFAC) is a group of firefighting agencies in the greater Williams area. Members include the Kaibab National Forest, Arizona State Land Department, fire departments from the City of Williams, Ashfork, Paulden, Valle-Wood, Tusayan, Junipine, Parks Bellemont, Sherwood Forest Estates, Red Lake South, and Kaibab Estates West. The purpose of the advisory council is for firefighting and emergency response agencies in the area to meet and work together on various issues common to all. These issues may include, but are not limited to; fire prevention, communications, fire training, mutual aid, evacuations, prescribed burning, smoke management, structure protection, and wildfire suppression. All agencies in WFAC provide mutual aid for emergency responses. Appendix 1 is a listing of all structural and wildfire equipment listed by agency. The City of Williams and Fire District map (Map 8) identifies the fire departments within the timbered zone along with their Insurance Services Office (ISO) rating.

Parks-Bellemont Fire Station, pile burning. Source: Kaibab National Forest

CITY of WILLIAMS & FIRE DISTRICTS INSURANCE SERVICES OFFICE RATING & WUI BOUNDARY

Kaibab National Forest
Williams Ranger District
Coconino County

Map 8



TGMc November 2004
/fsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst Fire Districts

VI. Wildland Urban Interface Area Identification and Cumulative Risk Rating

The preceding maps and the relative risks displayed were used to determine the greater Williams area wildland urban interface boundary. This 326,200 acre area is predominantly in the ponderosa pine and mixed conifer ecosystems and surrounds most of the widely scattered developed private lands. This large area was determined by the CWPP core team to better define the area at risk rather than using a simple buffer system to describe the wildland urban interface. The core team determined that an area as much as six miles to the south and west of developments was needed as history has shown that large catastrophic wildfires can easily spread this distance in one afternoon burning period. Evidence from the Rodeo-Chediski fire in eastern Arizona proved this on several occasions and the Bridger-Knoll fire on the North Kaibab Ranger District traveled over nine miles on the day it started.

Map 9 displays the cumulative risk rating within the WUI and was determined by combining the crown fire risk and the development risk maps into a cumulative risk-rating map. The intent of the map is to visually display the size and scope of the crown fire risk associated with developed private lands in the wildland urban interface. However, the red colored private lands on the cumulative risk map only depict private lands that have some level of development or infrastructure at risk and these private lands should not necessarily be interpreted at extreme risk for crown fire.

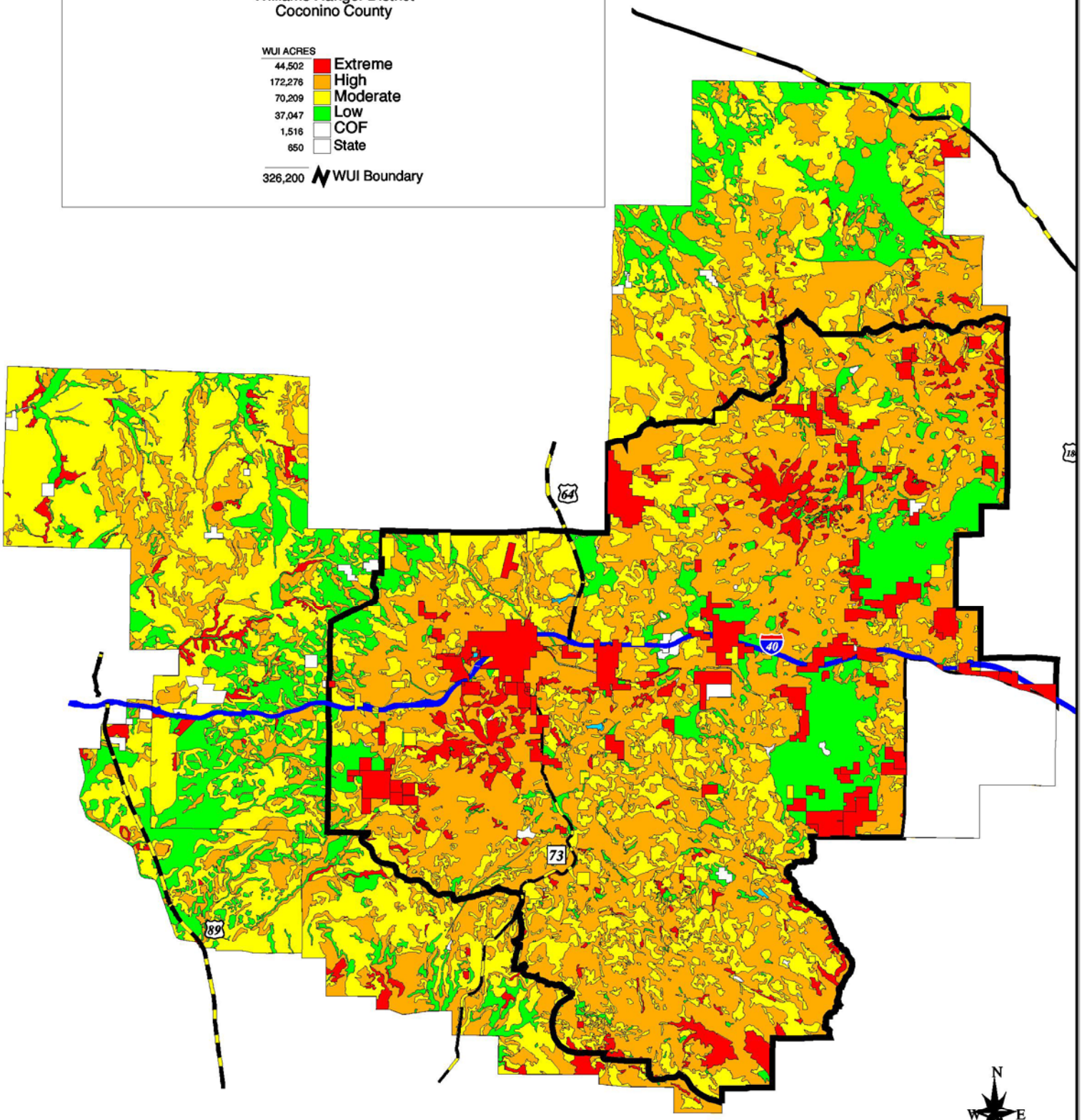
Tables of specific map information can be found in Appendix 2.

CUMULATIVE RISK ASSESSMENT & WUI BOUNDARY

CROWN FIRE RISK & DEVELOPMENT RISK COMBINED

Kaibab National Forest
Williams Ranger District
Coconino County

Map 9



TGMc November 2004
/lsfiles/unit/williams/afm/5150_fuel_mgt/cwpp_gkleindienst Cumulative Fire Risk Assessment